Exercise - I (Conceptual Questions) Build Up Your Understanding

RATE OF REACTION

1. Consider the chemical reaction :

$N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$

The rate of this reaction can be expressed in terms of concentration of $N_2(g)$, $H_2(g)$ or $NH_3(g)$. Identify the correct relationship amongst the rate expressions.

(1) Rate $= -\frac{d[N_2]}{dt} = -\frac{1}{3}\frac{d[H_2]}{dt} = \frac{1}{2}\frac{d[NH_3]}{dt}$

(2) Rate $= -\frac{d[N_2]}{dt} = -\frac{3d[H_2]}{dt} = \frac{2d[NH_3]}{dt}$

(3) Rate $= \frac{d[N_2]}{dt} = \frac{1}{3}\frac{d[H_2]}{dt} = \frac{1}{2}\frac{d[NH_3]}{dt}$

(4) Rate $= -\frac{d[N_2]}{dt} = -\frac{d[H_2]}{dt} = \frac{d[NH_3]}{dt}$

2. In the formation of sulphur trioxide by the contact process $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$; the rate of reaction is expressed as

$-\frac{d[O_2]}{dt} = 2.5 \times 10^{-4}$ mol L^{-1} s^{-1}

The rate of disappearance of (SO_2) will be

(1) 5×10^{-4} mol L^{-1} s^{-1}

(2) -2.25×10^{-4} mol L^{-1} s^{-1}

(3) 3.75×10^{-4} mol L^{-1} s^{-1}

(4) 50.0×10^{-4} mol L^{-1} s^{-1}

3. In a catalytic reaction involving the formation of ammonia by Haber's process $N_2 + 3H_2 \rightarrow 2NH_3$ the rate of appearance of NH_3 was measured as 2.5×10^{-4} mole L^{-1} s^{-1} The rate of disappearance of H_2 will be –

(1) 2.5×10^{-4} mol L^{-1} s^{-1}

(2) 1.25×10^{-4} mol L^{-1} s^{-1}

(3) 3.75×10^{-4} mol L^{-1} s^{-1}

(4) 5×10^{-4} mol L^{-1} s^{-1}

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4. Which of the following statement is correct for a reaction X + 2Y → Product (p)

(1) The rate of disappearance of X = twice the rate of disappearance of Y.

(2) The rate of disappearance of X = $\frac{1}{2}$ rate of appearance of product (p)

(3) The rate of appearance of product (p) = $\frac{1}{2}$ the rate of disappearance of Y

(4) The rate of appearance of product (p) = $\frac{1}{2}$ the rate of disappearance of X

5. For the reaction, $N_2O_5 \longrightarrow 2NO_2 + ½\ O_2$

Given $-\frac{d[N_2O_5]}{dt} = K_1[N_2O_5]$, $\frac{d[NO_2]}{dt} = {}_2[N_2O_5]$

$\frac{d[O_2]}{dt} = K_3[N_2O_5]$

The relation between K_1, K_2 and K_3 is –

(1) $2K_1 = K_2 = 4K_3$ (2) $K_1 = K_2 = K_3$

(3) $2K_1 = 4K_2 = K_3$ (4) None

6. Rate of formation of SO_3 according to the reaction $2SO_2+O_2 \rightarrow 2SO_3$ is 1.6×10^{-3} kg L^{-1} min^{-1} Hence rate of decomposition of SO_2 is :-

(1) 1.6×10^{-3} kg L^{-1} min^{-1}

(2) 8.0×10^{-4} kg L^{-1} min^{-1}

(3) 3.2×10^{-3} kg L^{-1} min^{-1}

(4) 1.28×10^{-3} kg L^{-1} min^{-1}

7. For a general chemical change $2A+3B \rightarrow$ products, the rate of disappearance of A is r_1 and of B is r_2. The rates r_1 and r_2 are related as :–

(1) $3r_1 = 2r_2$ (2) $r_1 = r_2$

(3) $2r_1 = 3r_2$ (4) $r_1^2 = 2r_2^2$

8. For the reaction $2A + B \rightarrow 3C + D$ Which of the following does not express the reaction rate ?

(1) $-\frac{1}{3}\frac{d[C]}{dt}$ (2) $-\frac{d[B]}{dt}$

(3) $\frac{d[D]}{dt}$ (4) $-\frac{1}{2}\frac{d[A]}{dt}$

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9. Consider the reaction
$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$
The correct equality relationship between $\frac{d[NH_3]}{dt}$ and $-\frac{d[H_2]}{dt}$ is :

(1) $\frac{d[NH_3]}{dt} = -\frac{1}{3}\frac{d[H_2]}{dt}$

(2) $+\frac{d[NH_3]}{dt} = -\frac{2}{3}\frac{d[H_2]}{dt}$

(3) $+\frac{d[NH_3]}{dt} = -\frac{3}{2}\frac{d[H_2]}{dt}$

(4) $\frac{d[NH_3]}{dt} = -\frac{d[H_2]}{dt}$

RATE LAW / ORDER / MOLECULARITY

10. For gaseous reaction, rate = k [A] [B]. If volume of container is reduced to $\frac{1}{4}$ of initial, then the rate of the reaction will be..... times of initial:-

(1) $\frac{1}{8}$ (2) 8 (3) $\frac{1}{16}$ (4) 16

11. 2A(g) + B(g) ⟶ Product is an elementary reaction, If pressure of both A and B is increased three times of the initial pressure, the rate of forward reaction will be ------ of the previous rate :-

(1) 9 times (2) 27 times

(3) $\frac{1}{9}$ times (4) $\frac{1}{27}$ times

12. The rate of certain hypothetical reaction
A + B + C → products is given by
$r = \frac{-d[A]}{dt} = K[A]^{1/2}[B]^{1/3}[C]^{1/4}$ The order of the reaction –

(1) 1 (2) $\frac{1}{2}$ (3) 2 (4) $\frac{13}{12}$

13. Which of the following rate law has an overall order of 0.5 for reaction involving substances x,y and z ?

(1) Rate = K (C_x) (C_y) (C_z)

(2) Rate = K $(C_x)^{0.5}(C_y)^{0.5}(C_z)^{0.5}$

(3) Rate = K $(C_x)^{1.5}$ $(C_y)^{-1}(C_z)°$

(4) Rate = K$(C_x)(C_z)°$ / $(C_y)^2$

14. A chemical reaction involves two reacting species. The rate of reaction is directly proportional to square of the concentration of one of them and inversely proportional to the concentration of the other. The order of reaction is –

(1) 1 (2) 2

(3) Zero (4) Unpredictable

15. For the reaction $H_2(g) + Br_2(g) \rightarrow 2HBr(g)$, the experimental data suggests, Rate = K $[H_2]$ $[Br_2]^{½}$. The order for this reaction is –

(1) 2 (2) $1\frac{1}{2}$ (3) 1 (4) $2\frac{1}{2}$

16. Select the rate law that corresponds to the data shown for the following reaction A + B → C

Exp.	[A]	[B]	Initial rate
1.	0.012	0.035	0.10
2.	0.024	0.070	1.6
3.	0.024	0.035	0.20
4.	0.012	0.070	0.80

(1) Rate = K $[B]^3$ (2) Rate = K$[B]^4$

(3) Rate = K$[A][B]^3$ (4) Rate = K$[A]^2[B]^2$

17. Select the rate law that corresponds to data shown for the following reaction 2A+B→ C+D :-

Exp.	[A]	[B]	Initial rate (Mol L^{-1} min^{-1})
1.	0.1	0.1	$7.5\ 10^{-3}$
2.	0.3	0.2	$9.0\ 10^{-2}$
3.	0.3	0.4	$3.6\ 10^{-1}$
4.	0.4	0.1	$3.6\ 10^{-2}$

(1) Rate = K $[A]^2[B]$ (2) Rate = K$[A][B]^2$

(3) Rate = K$[A][B]^3$ (4) Rate = K[A][B]

18. For a hypothetical reaction ; A + B → C the following data were obtained in three different experiments :–

[A] (mol L^{-1})	[B] (mol L^{-1})	Rate of reaction (Mol L^{-1} min^{-1})
0.01	0.01	$1.0\ 10^{-4}$
0.01	0.03	$9.0\ 10^{-4}$
0.03	0.03	$2.70\ 10^{-3}$

The rate law will be :–

(1) r = K$[A]^2[B]$ (2) r = K$[A][B]^2$

(3) r = K[A][B] (4) None of these

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19. Calculate the order of the reaction w.r.t. A and B:

[A] (mol L^{-1})	[B] (mol L^{-1})	Rate (Mol L^{-1} S^{-1})
0.05	0.05	1.2 10^{-3}
0.10	0.05	2.4 10^{-3}
0.05	0.10	1.2 10^{-3}

(1) 1 and 0 (2) 1 and 1
(3) 0 and 1 (4) None

20. For a chemical reaction A + B $\rightarrow$ product, the order is one with respect to each A and B. Value of x and y from the given data is :–

Rate (Mol L^{-1} S^{-1})	[A]	[B]
0.10	0.20 M	0.05 M
0.40	X	0.05 M
0.80	0.40 M	y

(1) 0.20, 0.80 (2) 0.80, 0.40
(3) 0.80, 0.20 (4) 0.40, 0.20

21. The rate law for the single step reaction 2A + B $\rightarrow$ 2C, is given by –
(1) Rate = K[A][B] (2) Rate = $K[A]^2[B]$
(3) Rate = K[2A] [B] (4) Rate = $K[A]^2[B]^\circ$

22. For a reaction of the type A + B $\rightarrow$ products, it is observed that doubling the concentration of A causes the reaction rate to increase four times but doubling the amount of B does not effect the rate. The rate equation is –
(1) Rate = K [A][B] (2) Rate = K $[A]^2$
(3) Rate = $K[A]^2[B]$ (4) Rate = $K[A]^2[B]^2$

23. Point out incorrect statement.
(1) Rate law is an experimental value
(2) Law of mass action is a theoretical proposal
(3) Rate law is more informative than law of mass action for developing mechanism
(4) Rate law is always different from the expression of law of mass action.

24. For an elementary process 2X + Y $\rightarrow$ Z + W, the molecularity is –
(1) 2 (2) 1
(3) 3 (4) Unpredictable

25. For a reaction A + B $\rightarrow$ products, the rate of the reaction was doubled when the concentration of A was doubled, the rate was again doubled when the concentration of both A & B were doubled the order of the reaction with respect to A & B are:–
(1) 1, 1 (2) 2, 0 (3) 1, 0 (4) 0, 1

26. For the reaction A + B $\rightarrow$ products, it is found that the order w.r.t. A is 1 and the order w.r.t. B is $\frac{1}{2}$. When the concentration of both A and B are increased four times, the rate will increase by a factor of :–
(1) 16 (2) 8 (3) 6 (4) 4

27. The rate law for a reaction A + B $\rightarrow$ product is rate = $K[A]^1[B]^2$. Then which one of the following statement is false :–
(1) If [B] is kept constant while [A] is doubled, the reaction will proceed twice as fast
(2) If [A] is kept constant while [B] is reduced to one quarter, the rate will be halved
(3) If [A] and [B] are both doubled, the reaction will proceed 8 times as fast
(4) This is a third order reaction

28. For a chemical reaction A $\rightarrow$ B, the rate of reaction doubles when the concentration of A is increased 8 times. The order of reaction w.r.t. A is :–
(1) 3 (2) $\frac{1}{2}$ (3) $\frac{1}{3}$ (4) Zero

29. The rate constant of a first order reaction depends on the :–
(1) Concentration of the reactant
(2) Concentration of the product
(3) Time
(4) Temperature

30. Consider the following reaction,
$KClO_3 + 6FeSO_4 + 3H_2SO_4 \longrightarrow KCl + 3Fe_2(SO_4)_3 + 3H_2O$
Which of the statements regarding this reaction is incorrect?
(1) It is a complex reaction
(2) It is a tenth order reaction
(3) It is completed in several steps
(4) Order of this reaction can be determined experimentally

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PSEUDO FIRST ORDER REACTION / MECHANISM OF REACTION

31. Following mechanism has been proposed for a reaction $2A + B \rightarrow D + E$

$A + B \rightarrow C + D$ .....(slow)

$A + C \rightarrow E$ .....(fast)

The rate law expression for the reaction is –

(1) $r = K[A]^2[B]$ (2) $r = K[A][B]$

(3) $r = K[A]^2$ (4) $r = K[A][C]$

32. The chemical reaction $2O_3 \rightarrow 3O_2$ proceeds as follows

$O_3 \rightleftharpoons O_2 + O$ ..... (fast)

$O + O_3 \rightarrow 2O_2$ ..... (slow)

The rate law expression should be –

(1) $r = K[O_3]^2$ (2) $r = K[O_3]^2[O_2]^{-1}$

(3) $r = K[O_3][O_2]$ (4) Unpredictable

33. The hypothetical reaction $A_2 + B_2 \rightarrow 2AB$ follows the mechanism as given below –

$A_2 \rightleftharpoons A + A$ ..... (fast)

$A + B_2 \rightarrow AB + B$ ..... (slow)

$A + B \rightarrow AB$ ..... (fast)

The order of the over all reaction is –

(1) 2 (2) 1 (3) 1½ (4) Zero

34. The rate for the reaction

$RCl + NaOH\ (aq) \rightarrow ROH + NaCl$ is given by rate = $k_1[RCl]$. The rate of the reaction is –

(1) Doubled on doubling the concentration of NaOH

(2) Halved on reducing the concentration of RCl to half

(3) Decreased on increasing the temperature of reaction

(4) Unaffected by increasing the temperature of the reaction

35. For reaction $NO_2 + CO \rightarrow CO_2 + NO$, the rate expression is, Rate = $k[NO_2]^2$

The number of molecules of CO involved in the slowest step will be –

(1) 0 (2) 1 (3) 2 (4) 3

36. The rate law of the reaction $A + 2B \rightarrow$ product is given by $\frac{d[P]}{dt} = K[A]^2[B]$. If A is taken in large excess, the order of the reaction will be –

(1) Zero (2) 1 (3) 2 (4) 3

37. The acidic hydrolysis of ester is –

(1) Psuedo Ist order reaction

(2) IInd order reaction

(3) Trimolecular reaction

(4) All of the above

38. The reaction $2A + B \rightarrow P$, follows the mechanism

$2A \rightleftharpoons A_2$ (fast)

$A_2 + B \rightarrow P$ (slow)

The order of the reaction is :–

(1) 1.5 (2) 3 (3) 1 (4) 2

39. For the reaction $2NO + Cl_2 \rightarrow 2NOCl$ the following mechanism has been proposed

$NO + Cl_2 \rightleftharpoons NOCl_2$ (fast)

$NOCl_2 + NO \rightarrow 2NOCl$ (slow) the rate law for the reaction is :-

(1) Rate = $K[NO]^2[Cl_2]$ (2) Rate = $K[NO][Cl_2]^2$

(3) Rate = $K[NOCl_2]$ (4) Rate = $K[NOCl]^2$

ZERO / FIRST / NTH ORDER REACTIONS

40. The rate constant is numerically the same for three reactions of first, second and third order respectively. Which one is true at a moment for rate of all three reactions if concentration of reactants is same and greater than 1 M.

(1) $r_1 = r_2 = r_3$ (2) $r_1 > r_2 > r_3$

(3) $r_1 < r_2 < r_3$ (4) All

41. K for a zero order reaction is 2×10^{-2} mol L^{-1} s^{-1}. If the concentration of the reactant after 25s is 0.5M, the initial concentration must have been.

(1) 0.5 M (2) 1.25 M

(3) 12.5 M (4) 1.0 M

42. The decomposition of N_2O_5 occurs as, $2N_2O_5 \rightarrow 4NO_2 + O_2$, and follows first order kinetics; hence

(1) The reaction is bimolecular

(2) The reaction is unimolecular

(3) $t_{1/2} \propto a^\circ$

(4) $t_{1/2} \propto a^2$

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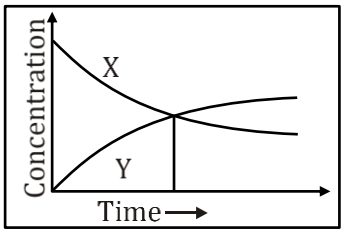
43. The accompanying figure depicts the change in concentration of species X and Y for the reaction X → Y as a function of time. The point of intersection of the two curves represents.



(1) $t_{1/2}$
(2) $t_{3/4}$
(3) $t_{2/3}$
(4) Data is insufficient to predict

44. If the first order reaction involves gaseous reactants and gaseous products the unit of its rate is -
(1) atm (2) atm s (3) atm s^{-1} (4) atm^2 s^2

45. Plot of log (a – x) vs time t is straight line. This indicates that the reaction is of –
(1) Second order (2) First order
(3) Zero order (4) Third order

46. The rate constant of a first order reaction is 4×10^{-3} s^{-1}. At a reactant concentration of 0.02 M, the rate of reaction would be–
(1) 8×10^{-5} M s^{-1} (2) 4×10^{-3} M s^{-1}
(3) 2×10^{-1} M s^{-1} (4) 4×10^{-1} M s^{-1}

47. In a first order reaction, the concentration of the reactant is decreased from 1.0 M to 0.25 M in 20 min. The rate constant of the reaction would be–
(1) 10 min^{-1} (2) 6.931 min^{-1}
(3) 0.6931 min^{-1} (4) 0.06931 min^{-1}

48. In a first order reaction, the value of a/(a – x) was found to be 8 after 10 minute. The rate constant is
(1) $\frac{(2.303\times 3\log 2)}{10}$ (2) $\frac{(2.303\times 2\log 3)}{10}$
(3) 10 × 2.303 × 2log3 (4) 10 × 2.303 × 3log2

49. 75 % of a first order reaction was found to complete in 32 min. When will 50 % of the same reaction complete –
(1) 24 min (2) 16 min
(3) 8 min (4) 4 min

50. A first order reaction has a half life period of 69.3 s. At 0.10 mol L^{-1} reactant concentration, the rate will be –
(1) 10^{-4} M s^{-1} (2) 10^{-3} M s^{-1}
(3) 10^{-1} M s^{-1} (4) 6.93×10^{-1} M s^{-1}

51. For a first order reaction A → products, the rate of reaction at [A] = 0.2 M is 1×10^{-2} mol $L^{-1}min^{-1}$. The half life period for the reaction is -
(1) 832 min. (2) 440 s
(3) 416 min. (4) 14 min.

52. 99 % of a first order reaction was completed in 32 min. when will 99.9 % of the reaction complete ?
(1) 50 min. (2) 46 min.
(3) 49 min. (4) 48 min.

53. What is the half life of a radioactive substance if 87.5% of any given amount of the substance disintegrate in 40 minutes ?
(1) 160 min (2) 10 min
(3) 20 min (4) 13 min 20 sec.

54. For a given reaction of first order, it takes 20 min for the concentration to drop from 1 M to 0.6 M. The time required for the concentration to drop from 0.6 M to 0.36 M will be :
(1) More than 20 min
(2) Less than 20 min
(3) Equal to 20 min
(4) Infinity

55. A first order reaction is carried out with an initial concentration of 10 mol per litre and 80% of the reactant changes into the product. Now if the same reaction is carried out with an initial concentration of 5 mol per litre for the same period, the percentage of the reactant changing to the product is.
(1) 40
(2) 80
(3) 160
(4) Cannot be calculated

56. The reaction L → M is started with 10 g/L. After 30 minute and 90minute, 5 g/L and 1.25 g/L are left respectively. The order of reaction is
(1) 0 (2) 2 (3) 1 (4) 3

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57. Doubling the initial concentration of a reactant doubles $t_{½}$ of the reaction, then order of the reaction is–
(1) 3 (2) 2 (3) 1 (4) 0

58. The half life period for catalytic decomposition of AB_3 at 50 mm is found to be 4 hrs and at 100 mm it is 2 hrs. The order of reaction is –
(1) 3 (2) 1 (3) 2 (4) 0

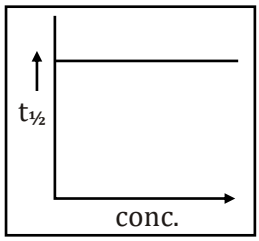
59. The rate constant for a reaction is 10.8×10^{-5} mol L^{-1} s^{-1} The reaction obeys –
(1) First order (2) Zero order
(3) Second order (4) All are wrong

60. A substance 'A' decomposes in solution following the first order kinetics flask I contains 1L of 1M. solution of A and flask II contains. 100 ml of 0.6 M solution. After 8 hr. the concentration of A in flask I become 0.25 M, what will be the time for concentration of A in flask II to become 0.3 M.
(1) 0.4 hr.
(2) 2.4 hr.
(3) 4.0 hr.
(4) Unpredictable as rate constant is not given

61. The rate constant (K) for the reaction 2A + B → product, was found to be 2.57×10^{-5} L mol^{-1} s^{-1} after 15 s, 2.60×10^{-5} L mol^{-1} s^{-1} after 30 s and 2.55×10^{-5} L mol^{-1} s^{-1} after 50 s. The order of reaction is
(1) 2 (2) 3 (3) Zero (4) 1

62. The rate constant for a second order reaction is 8×10^{-5} M^{-1} min^{-1} : How long will it take a 1M solution to be reduced to 0.5 M.
(1) 8.665×10^{3} min (2) 8×10^{-3} min
(3) 1.25×10^{4} min (4) 4×10^{-5} min

63. A graph between $t_{1/2}$ and concentration for n^{th} order reaction is a straight line. Reaction of this nature is completed 50% in 10 minutes when concentration is 2 mol L^{-1}. This is decomposed 50% in t minutes at 4 mol L^{-1}, n and t are respectively



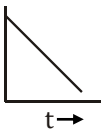
(1) 0, 20 min. (2) 1, 10 min.
(3) 1, 20 min. (4) 0, 5 min.

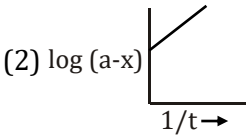
64. In the case of first order reaction, the ratio of time required for 99.9 % completion to 50 % completion is :–
(1) 2 (2) 5 (3) 10 (4) None

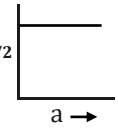
65. From different sets of data of $t_{1/2}$ at different initial concentrations say 'a' for a given reaction, the $[t_{1/2} \times a]$ is found to be constant. The order of reaction is :–
(1) 0 (2) 1 (3) 2 (4) 3

66. Which of the following statement is not correct for the reaction whose rate is r = k (rate constant)
(1) Rate of reaction is independent of concentration of reactant
(2) $t_{1/2}$ of reaction does not depend upon concentration of reactant
(3) Rate constant is independent of concentration of reactant
(4) This is zero order reaction

67. Which of the following curves represents a I^{st} order reaction :–

(1) 

(2) 

(3) 

(4) 1 & 3 both

68. The following data were obtained at a certain temperature for the decomposition of ammonia

p (mm)	50	100	200
$t_{1/2}$	3.64	1.82	0.91

The order of the reaction is :–
(1) 0 (2) 1 (3) 2 (4) 3

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69. A reaction is found to have the rate constant x s^{-1}, by what factor the rate is increased if initial concentration of reactant is tripled
(1) 3 (2) 9
(3) x (4) Remains same

70. Which is incorrect :–
(1) Half life of a first order reaction is independent of initial concentration
(2) Rate of reaction is constant for first order reaction
(3) Unit of K for second order reaction is mol^{-1} L s^{-1}
(4) Half life of zero order is proportional to initial concentration

71. Hydrolysis of ester in alkaline medium is :–
(1) First order reaction
(2) Second order reaction
(3) Zero order reaction
(4) Third order reaction

72. The expression which gives $\frac{1}{4}$th life of I^{st} order reaction is :–
(1) $\frac{K}{2.303}\log\frac{4}{3}$ (2) $\frac{2.303}{K}\log 3$
(3) $\frac{2.303}{K}\log\frac{3}{4}$ (4) $\frac{2.303}{K}\log\frac{4}{3}$

73. The rate constant of a zero order reaction is 0.2 mol $dm^{-3}h^{-1}$. If the concentration of the reactant after 30 minutes is 0.05 mol dm^{-3}. Then its initial concentration would be :-
(1) 6.05 mol dm^{-3} (2) 0.15 mol dm^{-3}
(3) 0.25 mol dm^{-3} (4) 4.00 mol dm^{-3}

74. A reaction is of first order. After 100 minutes, 75 gm of the reactant A are decomposed when 100 gm are taken initially, calculate the time required when 150 gm of the reactant A are decomposed, the initial weight taken is 200 gm :-
(1) 100 minutes (2) 200 minutes
(3) 150 minutes (4) 175 minutes

75. For which of the following, the unit of rate and rate constant of the reaction are identical :-
(1) First order reaction
(2) Zero order reaction
(3) Second order reaction
(4) Fractional order of reaction

TG: @Chalnaayaaar

76. A → Product, follows the first order kinetics. If the half life period of the reaction at $[A]_{Initial}$ = 0.2 mol L^{-1} is 20 min. then the value of rate constant would be:-
(1) 4 s^{-1} (2) 20 s^{-1}
(3) 4 lit. mol^{-1} $min.^{-1}$ (4) 0.034 min^{-1}

77. Correct statement about first order reaction is:-
(1) $t_{completion}$ = finite
(2) $t_{1/2} \propto \frac{1}{a}$
(3) Unit of K is mole lit^{-1} s^{-1}
(4) $t_{1/2} \times K$ = constant (at given temperature)

COLLISION THEORY AND FACTORS AFFECTING RATE OF REACTION

78. Activation energy of a reaction is –
(1) The energy released during the reaction
(2) The energy evolved when activated complex is formed
(3) Minimum extra amount of energy needed to overcome the potential barrier of reaction
(4) The energy needed to form one mole of the product

79. The minimum energy for molecules to enter into chemical reaction is called.
(1) Kinetic energy (2) Potential energy
(3) Threshold energy (4) Activation energy

80. The rate constant k_1 of a reaction is found to be double that of rate constant k_2 of another reaction. The relationship between corresponding activation energies of the two reactions at same temperature (E_1 & E_2) can be represented as
(1) $E_1 > E_2$ (2) $E_1 < E_2$
(3) $E_1 = E_2$ (4) $E_1 = 4E_2$

81. At room temperature, the reaction between NO and O_2 to give NO_2 is fast while that between CO and O_2 is slow it is due to –
(1) CO is smaller in size than that of NO
(2) CO is poisonous
(3) The activation energy for the reaction $2NO + O_2 \rightarrow 2NO_2$ is less than $2CO + O_2 \rightarrow 2CO_2$
(4) NO_2 is poisonous

TG: @Chalnaayaaar

82. Chemical reaction occurs as a result of collisions between reacting molecules. Therefore the reaction rate is given by
(1) Total number of collisions occurring in a unit volume per second
(2) Fraction of molecules which possess energy less than the threshold energy.
(3) Total number of effective collisions
(4) Temperature

83. An endothermic reaction A → B has an activation energy 15 kcal/mol and the heat of the reaction is 5 kcal/mol. The activation energy of the reaction B → A is –
(1) 20 kcal/mol (2) 15 kcal/mol
(3) 10 kcal/mol (4) Zero

84. A large increase in the rate of a reaction for a rise in temperature is due to –
(1) Increase in the number of collisions
(2) Increase in the number of activated molecules
(3) Lowering of activation energy
(4) Shortening of the mean free path

85. Rate of which reactions increases with temperature
(1) Of all reactions
(2) Of exothermic reactions
(3) Of endothermic reactions
(4) Can't be predicted

86. The rate of a chemical reaction doubles for every 10^0C rise in temperature. If the temperature is increased by 60^0C the rate of reaction increases by :
(1) 20 times (2) 32 times
(3) 64 times (4) 128 times

87. According to the Arrhenius equation, a straight line is to be obtained by plotting the logarithm of the rate constant of chemical reaction (log k) against.
(1) T (2) log T
(3) $\frac{1}{T}$ (4) log $\frac{1}{T}$

88. Which plot will give the value of activation energy.
(1) k v/s T (2) $\frac{1}{k}$ v/s T
(3) lnk v/s T (4) lnk v/s $\frac{1}{T}$

89. Given that k is the rate constant of any reaction at temp T then the value of $\lim_{T\to\infty} \log k$ _____.
(1) A ≅ 2.303 (2) A
(3) 2.303 A (4) log A

90. The rate constant, the activation energy and the frequency factor of a chemical reaction at 25^0C are 3×10^{-4} s^{-1}; 104.4 kJ mol^{-1} and 6.0×10^{14} s^{-1} respectively, the value of the rate constant as T→ ∞ is.
(1) 2×10^8 s^{-1} (2) 6×10^{14} s^{-1}
(3) Infinity (4) 3.6×10^{30} s^{-1}

91. For an endothermic reaction where ΔH represents the enthalpy of the reaction in kJ/mol ; the minimum value for the energy of activation will be
(1) Less than ΔH (2) Zero
(3) More than ΔH (4) Equal to ΔH

92. The rate of reaction increases 2.3 times when the temperature is raised from 300 K to 310 K. If K is the rate constant at 300 K then the rate constant at 310 K will be equal to –
(1) 2 k (2) k (3) 2.3 k (4) 3 k^2

93. If the concentration units are reduced by n times then the value of rate constant of first order will
(1) Increases by n times
(2) Decreases by factor of n
(3) Remain constant
(4) Decrease 1/n times

TG: @Chalnaayaaar

94. Which is used in the determination of reaction rates.
(1) Reaction Temperature
(2) Reaction Concentration
(3) Specific rate constant
(4) All of these

95. The rate constant of a first order reaction depends on the :–
(1) Concentration of the reactant
(2) Concentration of the product
(3) Volume of the reaction container
(4) Temperature

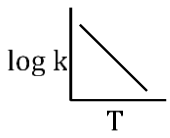
96. For the decomposition of $N_2O_5(g)$ it is given that $2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$ activation energy = E_a, $N_2O_5(g) \rightarrow 2NO_2(g) + \frac{1}{2}O_2(g)$ activation energy = E_a' then
(1) $E_a = 2E'_a$ (2) $E_a > E'_a$
(3) $E_a < E'_a$ (4) $E_a = E'_a$

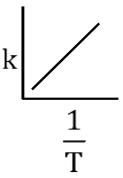
97. For a reaction in which case the activation energies of forward and reverse reactions are equal :–
(1) $\Delta H = 0$
(2) $\Delta S = 0$
(3) The order is zero
(4) There is no catalyst

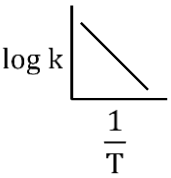
98. The energy of activation of a forward reaction is 50 kcal. The energy of activation of its backward reaction is:–
(1) Equal to 50 kcal.
(2) Greater than 50 kcal.
(3) Less than 50 kcal.
(4) Either greater or less than 50 kcal.

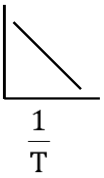
99. An exothermic reaction X → Y has an activation energy 30 kJ mol^{-1}. If energy change (ΔH) during the reaction is – 20 kJ, then the activation energy for the reverse reaction is :–
(1) 10 kJ (2) 20 kJ
(3) 50 kJ (4) – 30 kJ

TG: @Chalnaayaaar

100. Which of the following plot is in accordance with the Arrhenius equation :–
(1) 

(2) 

(3) 

(4) 

101. The rate of reaction increases with increase in temperature because :–
(1) Collision is increased
(2) Energy of products decreases
(3) Fraction of molecules possessing energy $\geq E_T$ (Threshold energy) increases
(4) Mechanism of a reaction is changed

102. For a certain gaseous reaction, rise of temperature from 25° C to 35° C doubles the rate of reaction. What is the value of activation energy :–
(1) $\frac{10}{2.303R \times 298 \times 308}$
(2) $\frac{2.303 \times 10}{298 \times 308R}$
(3) $\frac{0.693R \times 10}{290 \times 308}$
(4) $\frac{0.693R \times 298 \times 308}{10}$

103. For producing the effective collisions, the colliding molecules must possess :-
(1) A certain minimum amount of energy
(2) Energy equal to or greater than threshold energy
(3) Proper orientation
(4) Threshold energy as well as proper orientation of collision

TG: @Chalnaayaaar

104. The half life for a reaction ..... of temperature :-
(1) Independent
(2) Increases with increase
(3) Decreases with increase
(4) Increases or decreases with increase

105. The activation energy for a chemical reaction depends upon :-
(1) Temperature
(2) Nature of reacting species
(3) Concentration of the reacting species
(4) Collision frequency

106. During decomposition of an activated complex
(1) Some energy is absorbed
(2) Some energy is released
(3) No energy change
(4) Both (1) & (2)

EXERCISE-I (Conceptual Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	1	1	3	3	1	4	1	1	2	4	2	4	3	1	2
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	3	2	2	1	3	2	2	4	3	3	2	2	3	4	2
Question	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Answer	2	2	3	2	1	2	1	2	1	3	4	3	1	3	2
Question	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Answer	1	4	1	2	2	4	4	4	3	2	3	4	3	2	3
Question	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Answer	1	3	2	3	3	2	4	3	1	2	2	4	2	1	2
Question	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Answer	4	4	3	3	2	3	3	3	2	1	3	3	4	4	2
Question	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Answer	3	3	3	4	4	4	1	4	3	3	3	4	4	3	2
Question	106														
Answer	2														

TG: @Chalnaayaaar

Exercise - II (Previous Year Questions) AIPMT/NEET

AIPMT 2009

1. For the reaction, $N_2 + 3H_2 \rightarrow 2NH_3$, if $\frac{d[NH_3]}{dt} = 2 \times 10^{-4}$ mol $L^{-1}s^{-1}$, the value of $\frac{-d[H_2]}{dt}$ would be :-

(1) 1×10^{-4} mol L^{-1} s^{-1} (2) 3×10^{-4} mol L^{-1} s^{-1}

(3) 4×10^{-4} mol L^{-1} s^{-1} (4) 6×10^{-4} mol L^{-1} s^{-1}

2. For the reaction A + B $\longrightarrow$ products, it is observed that :-

(a) On doubling the initial concentration of A only, the rate of reaction is also doubled and

(b) On doubling the initial concentrations of both A and B, there is a change by a factor of 8 in the rate of the reaction.

The rate of this reaction is given by :-

(1) rate = k[A][B] (2) rate = $k[A]^2[B]$

(3) rate = $k[A][B]^2$ (4) rate = $k[A]^2[B]^2$

3. In the reaction

$BrO_3^-(aq) + 5Br^-(aq) + 6H^+ \rightarrow 3Br_2(\ell) + 3H_2O(l)$

The rate of appearance of bromine (Br_2) is related to rate of disappearance of bromide ions as following :-

(1) $\frac{d[Br_2]}{dt} = \frac{3}{5}\frac{d[Br^-]}{dt}$

(2) $\frac{d[Br_2]}{dt} = -\frac{3}{5}\frac{d[Br^-]}{dt}$

(3) $\frac{d[Br_2]}{dt} = -\frac{5}{3}\frac{d[Br^-]}{dt}$

(4) $\frac{d[Br_2]}{dt} = \frac{5}{3}\frac{d[Br^-]}{dt}$

4. Half life period of a first-order reaction is 1386 s. The specific rate constant of the reaction is :-

(1) 5.0×10^{-2} s^{-1} (2) 5.0×10^{-3} s^{-1}

(3) 0.5×10^{-2} s^{-1} (4) 0.5×10^{-3} s^{-1}

TG: @Chalnaayaaar

AIPMT 2010

5. The rate of the reaction

$2NO + Cl_2 \rightarrow 2NOCl$ is given by the rate equation rate = $k[NO]^2[Cl_2]$

the value of rate constant can be increased by:

(1) Increasing the concentration of NO

(2) Increasing the concentration of the Cl_2

(3) Increasing the temperature

(4) All of these

6. For the reaction $N_2O_5(g) \longrightarrow 2NO_2(g) + \frac{1}{2}O_2(g)$ the value of rate of disappearance of N_2O_5 is given as 6.25×10^{-3} mol $L^{-1}s^{-1}$. The rate of formation of NO_2 and O_2 is given respectively as:-

(1) 1.25×10^{-2} mol $L^{-1}s^{-1}$ and 6.25×10^{-3} mol $L^{-1}s^{-1}$

(2) 6.25×10^{-3} mol $L^{-1}s^{-1}$ and 6.25×10^{-3} mol $L^{-1}s^{-1}$

(3) 1.25×10^{-2} mol $L^{-1}s^{-1}$ and 3.125×10^{-3} mol $L^{-1}s^{-1}$

(4) 6.25×10^{-3} mol $L^{-1}s^{-1}$ and 3.125×10^{-3} mol $L^{-1}s^{-1}$

7. During the kinetic study of the reaction, $2A + B \rightarrow C + D$, following results were obtained:-

Ex. No.	[A](mol L^{-1})	[B](mol L^{-1})	Initial rate of formation of D(mol $L^{-1}min^{-1}$)
I	0.1	0.1	6.0×10^{-3}
II	0.3	0.2	7.2×10^{-2}
III	0.3	0.4	2.88×10^{-1}
IV	0.4	0.1	2.40×10^{-2}

Based on the above data which one of the following is correct ?

(1) rate = $k[A][B]^2$ (2) rate = $k[A]^2[B]$

(3) rate = k[A][B] (4) rate = $k[A]^2[B]^2$

TG: @Chalnaayaaar

8. For an endothermic reaction, energy of activation is E_a and enthalpy of reaction is ΔH (both of these in kJ/mol). Minimum value of E_a will be :-

(1) Equal to zero (2) Less than ΔH

(3) Equal to ΔH (4) More than ΔH

AIPMT Pre. 2011

9. Which one of the following statements for the order of a reaction is incorrect ?

(1) Order can be determined only experimentally

(2) Order is not influenced by stoichiometric coefficient of the reactants

(3) Order of reaction is sum of power to the concentration terms of reactants to express the rate of reaction

(4) Order of reaction is always whole number

AIPMT Mains 2011

10. The unit of rate constant for a zero order reaction is :-

(1) s^{-1} (2) mol L^{-1} s^{-1}

(3) L mol^{-1} s^{-1} (4) L^2 mol^{-2} s^{-1}

11. The half life of a substance in a certain enzyme-catalysed first order reaction is 138 s. The time required for the concentration of the substance to fall from 1.28 mg L^{-1} to 0.04 mg L^{-1} :-

(1) 276 s (2) 414 s (3) 552 s (4) 690 s

12. The rate of the reaction $2N_2O_5 \rightarrow 4NO_2 + O_2$ can be written in three ways

$$\frac{-d[N_2O_5]}{dt} = k[N_2O_5]$$

$$\frac{d[NO_2]}{dt} = k'[N_2O_5]$$

$$\frac{d[O_2]}{dt} = k''[N_2O_5]$$

The relationship between k and k' and between k and k" are :-

(1) k' = k ; k" = k (2) k' = 2k ; k" = k

(3) k' = 2k ; k" = k/2 (4) k' = 2k ; k" = 2k

AIPMT Pre. 2012

13. In a zero-order reaction for every 10° rise of temperature, the rate is doubled. If the temperature is increased from 10°C to 100°C, the rate of the reaction will become:

(1) 64 times (2) 128 times

(3) 256 times (4) 512 times

14. In a reaction A + B → Product, rate is doubled when the concentration of B is doubled and rate increased by a factor of 8 when the concentrations of both the reactants (A and B) are doubled, rate law for the reaction can be written as:

(1) Rate = k[A][B] (2) Rate = $k[A]^2[B]$

(3) Rate = $k[A][B]^2$ (4) Rate = $k[A]^2[B]^2$

AIPMT Mains 2012

15. Activation energy (E_a) and rate constants (k_1 and k_2) of a chemical reaction at two different temperatures (T_1 and T_2) are related by :

(1) $\ln \frac{k_2}{k_1} = -\frac{E_a}{R}\left(\frac{1}{T_2} + \frac{1}{T_1}\right)$

(2) $\ln \frac{k_2}{k_1} = \frac{E_a}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$

(3) $\ln \frac{k_2}{k_1} = -\frac{E_a}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$

(4) $\ln \frac{k_2}{k_1} = -\frac{E_a}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$

TG: @Chalnaayaaar

NEET-UG 2013

16. A reaction having equal energies of activation for forward and reverse reactions has :-

(1) $\Delta H = \Delta G = \Delta S = 0$ (2) $\Delta S = 0$

(3) $\Delta G = 0$ (4) $\Delta H = 0$

17. What is the activation energy of a reaction if its rate doubles when the temperature is raised from 20°C to 35°C ? ($R = 8.314\ J\ mol^{-1}\ K^{-1}$)

(1) 15.1 kJ mol^{-1} (2) 342 kJ mol^{-1}

(3) 269 kJ mol^{-1} (4) 34.7 kJ mol^{-1}

AIPMT 2015

18. The activation energy of a reaction can be determined from the slope of which of the following graphs ?

(1) $\frac{\ln k}{T}$ v / s.T (2) In k v/s. $\frac{1}{T}$

(3) $\frac{T}{\ln k}$ v / s. $\frac{1}{T}$ (4) In k v/s. T

19. When initial concentration of a reactant is doubled in a reaction, its half-life period is not affected. The order of the reaction is :-

(1) First

(2) Second

(3) More than zero but less than first

(4) Zero

Re-AIPMT 2015

20. The rate constant of the reaction A → B is 0.6×10^{-3} M sec^{-1}. If the concentration of A is 5 M, then concentration of B after 20 min is :-

(1) 0.36 M (2) 0.72 M

(3) 1.08 M (4) 3.60 M

NEET-I 2016

21. The rate of a first-order reaction is 0.04 mol $L^{-1}s^{-1}$ at 10 s and 0.03 mol L^{-1} s^{-1} at 20 s after initiation of the reaction. The half-life period of the reaction is :

(1) 24.1 s (2) 34.1 s (3) 44.1 s (4) 54.1 s

22. The addition of a catalyst during a chemical reaction alters which of the following quantities ?

(1) Entropy (2) Internal energy

(3) Enthalpy (4) Activation energy

NEET-II 2016

23. The decomposition of phosphine (PH_3) on tungsten at low pressure is a first-order reaction. It is because the

(1) Rate is independent of the surface coverage

(2) Rate of decomposition is very slow

(3) Rate is proportional to the surface coverage

(4) Rate is inversely proportional to the surface coverage

NEET(UG) 2017

24. Mechanism of a hypothetical reaction $X_2 + Y_2 \rightarrow 2XY$ is given below :

(i) $X_2 \rightleftharpoons X + X$(fast)

(ii) $X + Y_2 \rightarrow XY + Y$ (slow)

(iii) $X + Y \rightarrow XY$ (fast)

The overall order of the reaction will be :

(1) 2 (2) 0 (3) 1.5 (4) 1

25. A first order reaction has a specific reaction rate of 10^{-2} s^{-1}. How much time will it take for 20 g of the reactant to reduce to 5 g ?

(1) 138.6 s (2) 346.5 s

(3) 693.0 s (4) 238.6 s

TG: @Chalnaayaaar

TG: @Chalnaayaaar

NEET(UG) 2018

26. The correct difference between first- and second-order reaction is that

(1) The rate of a first-order reaction does not depend on reactant concentration; the rate of a second-order reaction does depend on reactant concentrations.

(2) The half-life of a first-order reaction does not depend on $[A]_0$; the half-life of a second-order reaction does depend on $[A]_0$

(3) A first-order reaction can be catalyzed; a second-order reaction cannot be catalyzed.

(4) The rate of a first-order reaction does depend on reactant concentrations; the rate of a second-order reaction does not depend on reactant concentrations

27. When initial concentration of the reactant is doubled, the half-life period of a zero order reaction

(1) Is halved

(2) Is doubled

(3) Is tripled

(4) Remains unchanged

NEET(UG) 2019

28. If the rate constant for a first order reaction is k, then the time (t) required for the completion of 99% of the reaction is given by:-

(1) t = 0.693/k (2) t = 6.909/k

(3) t = 4.606/k (4) t = 2.303/k

29. For the chemical reaction

$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

the **correct** option is :

(1) $-\frac{1}{3}\frac{d[H_2]}{dt} = -\frac{1}{2}\frac{d[NH_3]}{dt}$

(2) $-\frac{d[N_2]}{dt} = 2\frac{d[NH_3]}{dt}$

(3) $-\frac{d[N_2]}{dt} = \frac{1}{2}\frac{d[NH_3]}{dt}$

(4) $3\frac{d[H_2]}{dt} = 2\frac{d[NH_3]}{dt}$

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NEET(UG) 2019 (Odisha)

30. A first order reaction has a rate constant of 2.303×10^{-3} s^{-1}. The time required for 40g of this reactant to reduce to 10 g will be-

[Given that $\log_{10} 2=0.3010$]

(1) 230.3 s (2) 301 s

(3) 2000 s (4) 602 s

31. For a reaction, activation energy $E_a=0$ and the rate constant at 200K is $1.6\times10^6 s^{-1}$. The rate constant at 400K will be-

[Given : gas constant R= 8.314 J K^{-1} mol^{-1}]

(1) 3.2×10^4 s^{-1} (2) 1.6×10^6 s^{-1}

(3) 1.6×10^3 s^{-1} (4) 3.2×10^6 s^{-1}

NEET (UG) 2020

32. The rate constant for a first order reaction is 4.606×10^{-3} s^{-1}. The time required to reduce 2.0 g of the reactant to 0.2 g is :

(1) 1000 s (2) 100 s

(3) 200 s (4) 500 s

33. An increase in the concentration of the reactants of a reaction leads to change in :

(1) Collision frequency (2) Activation energy

(3) Heat of reaction (4) Threshold energy

NEET (UG) 2020 (COVID-19)

34. The half-life for a zero order reaction having 0.02 M initial concentration of reactant is 100 s. The rate constant (in mol L^{-1} s^{-1}) for the reaction is

(1) 1.0×10^{-4} (2) 2.0×10^{-4}

(3) 2.0×10^{-3} (4) 1.0×10^{-2}

35. In collision theory of chemical reaction, Z_{AB} represents

(1) The fraction of molecules with energies greater than E_a

(2) The collision frequency of reactants, A and B

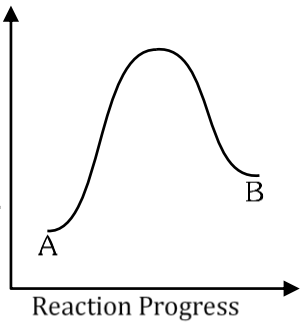
(3) Steric factor

(4) The fraction of molecules with energies equal to E_a

TG: @Chalnaayaaar

NEET (UG) 2021

36. For a reaction A → B, enthalpy of reaction is –4.2 kJ mol^{-1} and enthalpy of activation is 9.6 kJ mol^{-1}. The correct potential energy profile for the reaction is shown in option.

(1)


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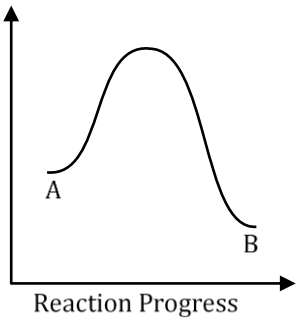

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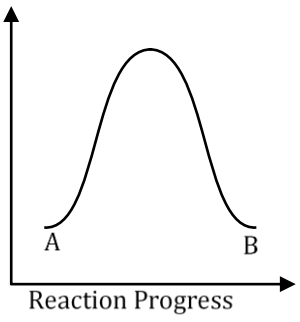
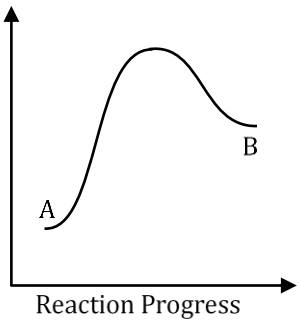


(4)


37. The slope of Arrhenius Plot $\left(\ln k \text{ v/s } \frac{1}{T}\right)$ of first order reaction is -5×10^3 K. The value of E_a of the reaction is. Choose the correct option for your answer.

[Given R=8.314 JK^{-1} mol^{-1}]

(1) 41.5 kJ mol^{-1} (2) 83.0 kJ mol^{-1}

(3) 166 kJ mol^{-1} (4) –83 kJ mol^{-1}

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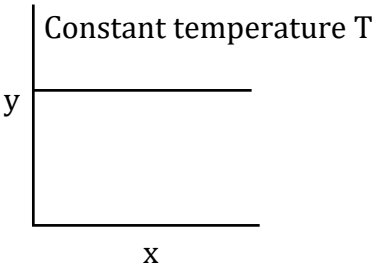
38. The given graph is a representation of kinetics of a reaction.



The y and x axes for zero and first order reactions, respectively are

(1) Zero order (y = concentration and x = time), first order (y = rate constant and x = concentration)

(2) Zero order (y = rate and x = concentration), first order (y = $t_{1/2}$ and x = concentration)

(3) Zero order (y = rate and x = concentration), first order (y = rate and x = $t_{1/2}$)

(4) Zero order (y = concentration and x = time), first order (y = $t_{1/2}$ and x = concentration)

39. For a first order reaction A → Products, initial concentration of A is 0.1 M, which becomes 0.001 M after 5 minutes. Rate constant for the reaction in min^{-1} is

(1) 0.9212 (2) 0.4606

(3) 0.2303 (4) 1.3818

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40. The half life of a first order reaction is 2000 years. If the concentration after 8000 years is 0.02 M, then the initial concentration was :
(1) 0.16 M (2) 0.32 M
(3) 0.08 M (4) 0.04 M

41. For a chemical reaction $4A + 3B \rightarrow 6C + 9D$ rate of formation of C is 6×10^{-2} mol L^{-1} s^{-1} and rate of disappearance of A is 4×10^{-2} mol L^{-1} s^{-1}. The rate of reaction and amount of B consumed in interval of 10 seconds, respectively will be :
(1) 1×10^{-2} mol L^{-1} s^{-1} and 30×10^{-2} mol L^{-1}
(2) 10×10^{-2} mol L^{-1} s^{-1} and 10×10^{-2} mol L^{-1}
(3) 1×10^{-2} mol L^{-1} s^{-1} and 10×10^{-2} mol L^{-1}
(4) 10×10^{-2} mol L^{-1} s^{-1} and 30×10^{-2} mol L^{-1}

EXERCISE-II (Previous Year Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	2	3	2	4	3	3	1	4	4	2	4	3	4	2	2,4
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	4	4	2	1	2	1	4	3	3	1	2	2	3	3	4
Question	31	32	33	34	35	36	37	38	39	40	41				
Answer	2	4	1	1	2	2	1	2	1	2	1				

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Exercise – III (Analytical Questions) Master Your Understanding

1. Given below are two statements:

Statement-I : Rate of zero order reactions is independent of temperature.

Statement-II : Half-life of zero order reactions is independent of concentration.

In the light of the above statements, choose the most appropriate answer from the options given below:

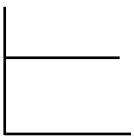
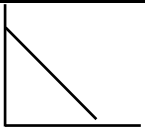
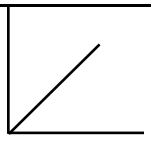
(1) Both Statement-I & Statement-II are correct and the Statement-II is a correct explanation of Statement-I.

(2) Both Statement-I & Statement-II are correct but Statement-II is not a correct explanation of Statement-I.

(3) Statement I is correct and Statement II is incorrect.

(4) Both Statement I and Statement II are incorrect.

2. Match the following

(a)	$[A]_t$ Vs time for zero order	(p)	
(b)	Half -life Vs Initial concentration for zero order	(q)	
(c)	Rate Vs time for zero order	(r)	
(d)	Rate constant Vs Temperature	(s)	

(1) (a) → (r), (b) → (s), (c) → (p), (d) → (q)

(2) (a) → (s), (b) → (r), (c) → (p), (d) → (q)

(3) (a) → (r), (b) → (s), (c) → (q), (d) → (p)

(4) (a) → (s), (b) → (r), (c) → (q), (d) → (p)

3. Consider the following statements :

(a) Time required for 93.75% completion is twice the time required for 75% completion for a Ist order reaction.

(b) In a Ist order reaction; $[A]_t = \frac{[A]_0}{e^2}$.

(c) Rate of exothermic reactions increases with rise in temperature.

(d) Lower is the activation energy of a reaction, higher is its temperature coefficient.

Which of the statements are incorrect ?

(1) (b), (c), (d) (2) (a), (b), (d)

(3) (b), (d) (4) (c), (d)

4. Given below are two statements; one is labelled as **Assertion (A)** and the other is labelled as **Reason(R)**.

Assertion (A) : For a reaction A → P, Rate and Rate constant are numerically equal when [A] = 1M.

Reason (R) : Rate and rate constant are equal for zero order reaction involving single reactant.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both Assertion & Reason are correct and the Reason is a correct explanation of Assertion.

(2) Both Assertion & Reason are correct but Reason is not a correct explanation of Assertion.

(3) Assertion is correct and Reason is incorrect.

(4) Both Assertion and Reason are incorrect.

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5. Given below are two statements:

Statement-I : Catalyst does not change equilibrium constant of a reaction.

Statement-II : Catalyst decreases the time required to attain equilibrium.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both Statement-I & Statement-II are correct and the Statement-II is a correct explanation of Statement-I.

(2) Both Statement-I & Statement-II are correct but Statement-II is not a correct explanation of Statement-I.

(3) Statement I is correct and Statement II is incorrect.

(4) Both Statement I and Statement II is incorrect.

6. Match the following :

(a)	Slope of ℓnK Vs $\frac{1}{T}$ graph	(p)	$e^{-Ea/RT}$
(b)	Threshold energy – Reactant energy	(q)	$(E_a)_{forward} - (E_a)_{backward}$
(c)	Fraction of molecules with Energy $\geq E_a$	(r)	E_a
(d)	$(\Delta H)_{forward}$ for reversible reaction	(s)	$\frac{-E_a}{R}$

(1) (a) → (r), (b) → (q), (c) → (p), (d) → (s)

(2) (a) → (s), (b) → (r), (c) → (p), (d) → (q)

(3) (a) → (s), (b) → (r), (c) → (q), (d) → (p)

(4) (a) → (q), (b) → (s), (c) → (p), (d) → (r)

7. Consider the following statements :

(a) Order of a reaction is an experimental quantity.

(b) Order is applicable only for elementary reactions.

(c) Rate constant for a first order gaseous reaction will have the unit of atm. s^{-1}.

(d) Half-life period of a reaction decreases with increases in temperature.

Which statements are correct ?

(1) b, c (2) a, b, d (3) a, d (4) c, d

8. Given below are two statements; one is labelled as **Assertion (A)** and the other is labelled as **Reason(R)**.

Assertion (A) : $t_{80\%} = 2 \times t_{40\%}$ for a zero order reaction.

Reason (R) : Zero order reaction proceeds with uniform rate.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

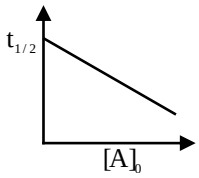
(1) If both Assertion & Reason are correct and the Reason is a correct explanation of Assertion.

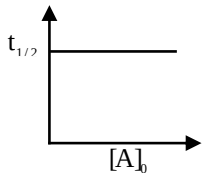
(2) If both Assertion & Reason are correct but Reason is not a correct explanation of Assertion.

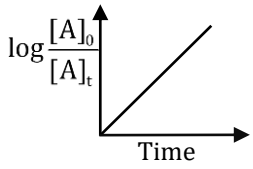
(3) If Assertion is correct and Reason is incorrect.

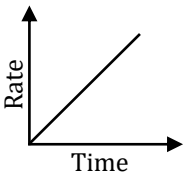
(4) If both Assertion and Reason is incorrect.

9. Which of the following graphs are correct for a first order reaction ?

(a) 

(b) 

(c) 

(d) 

(1) a, b & c (2) b & c

(3) a, b (4) b, c & d

10. Which of the following statements are correct according to Arrhenius equation ?

(a) Rate of a reaction increases with increase in temperature.

(b) Rate of a reaction increases with decreases in activation energy.

(c) Rate constant decreases exponentially with increase in temperature.

(4) Rate of reaction decreases with decrease in activation energy.

(1) a, b (2) b, d

(3) a, b and c (4) a, d

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11. For an elementary reaction

$A_{(g)} \rightarrow B_{(g)} + C_{(g)}$

the half life period is 20 min. Calculate the time at which concentration of A will be reduced to 20% of original concentration ?

(1) 92 min. (2) 23 min.

(3) 46 min. (4) 184 min.

12. For a first order reaction $t_{50\%}$ is 12 hr. If the initial mass of the reactant is 100 kg then calculate the mass of reactant consumed during the second day of reaction.

(1) 18.75 kg (2) 93.75 kg

(3) 6.25 kg (4) 11.25 kg

13. Match the items of column I and column II.

Column-I		Column-II	
(i)	Mathematical expression for rate of reaction	(a)	rate constant
(ii)	Rate of reaction for zero order reaction is equal to	(b)	rate law
(iii)	Unit of rate constant for zero order reaction is same as that of	(c)	order of slowest step
(iv)	Order of a complex reaction is determined by	(d)	rate of a reaction

	(i)	(ii)	(iii)	(iv)
(1)	b	a	d	c
(2)	b	d	a	c
(3)	b	a	c	d
(4)	c	a	b	d

14. According to Maxwell Boltzmann distribution of energy.

(a) The fraction of molecules with most probable kinetic energy decreases at higher temperature.

(b) The fraction of molecules with most probable kinetic energy increases at higher temperature

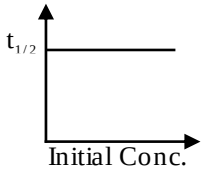
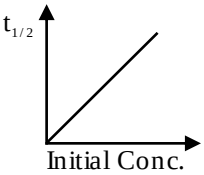
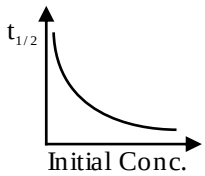
(c) Most probable kinetic energy increases at higher temperature.

(d) Most probable kinetic energy decreases at higher temperature.

(1) a, b are correct (2) a, c are correct

(3) b, c are correct (4) b, d are correct

15. Match the group given in column I with the order of reaction given in column II.

Column-I		Column-II	
(i)		(a)	First order
(ii)		(b)	Zero order
(iii)		(c)	Second order

	(i)	(ii)	(iii)
(1)	a	b	c
(2)	b	c	a
(3)	b	a	c
(4)	c	a	b

EXERCISE-III (Analytical Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	4	1	3	2	2	2	3	1	2	1	3	1	1	2	1